



U.S. Department
of Transportation

**Federal Aviation
Administration**

Memorandum

Subject: Action: Review and Concurrence, Equivalent Level of Safety Finding for the Goodrich Aviation Technical Services, Inc. (GATS) Interior Modification to a Bombardier Aerospace Model BD-700-1A10.	Date: July 23, 2002
FAA Project Number SP5109SE-T	Reg Ref: §§25.811(d)(1)(2)(3) and 25.812(b)(1).
From: Manager, Airframe and Cabin Safety Branch, ANM-115	Reply to Attn of: Dan Jacquet Airframe, ANM-120S
To: Manager, Transport Standards Staff ANM-110	ELOS Memo #: SP5109SE-T-C-1

Background

The certification basis for the Bombardier BD-700-1A10 airplane requires compliance with §§ 25.811 and 25.812 as amended through Amendment 25-88, effective November 8, 1996. The Bombardier BD-700-1A10 airplane is certified for up to nineteen passengers as specified on Type Certificate Data Sheet T00003NY. The emergency exit arrangement for a Bombardier BD-700-1A10 consists of a Type I exit on the left side of the aircraft at fuselage station 330.00 and one Type III overwing exit on the right side of the aircraft at fuselage station 632.10.

Section 25.811(d)(1) requires a passenger emergency exit locator sign above the aisle near each passenger emergency exit or at another overhead location if it is more practical because of low headroom, except that one sign may serve more than one exit if each exit can be seen readily from the sign. Section 25.811(d)(2) requires a passenger emergency exit marking sign next to each passenger emergency exit, except that one sign may serve two such exits if they both can be seen readily from the sign. Section 25.811(d)(3) requires a sign on each bulkhead or divider that prevents fore and aft vision along the passenger cabin to indicate emergency exits beyond and obscured by the bulkhead or divider.

Section 25.812(b)(1) requires that each passenger emergency exit locator sign required by § 25.811(d)(1), each passenger emergency exit marking sign required by § 25.811(d)(2) and each bulkhead sign required by § 25.811(d)(3) must have red letters at least 1½ inches high on an illuminated white background and must have an area of at least 21 square inches excluding the letters.

GATS proposed the below for the Bombardier Aerospace Model BD-700-1A10. Attached is a figure that indicates the exit sign locations.

1. Type I Locator and Marker Sign: GATS proposed to place an electrically-illuminated exit locator sign on the aft-facing, upper-inboard edge of a nearby bulkhead and one sign above the passenger door in direct compliance with § 25.811(d)(1),(2).

2. Type III Locator and Marker Signs: GATS proposed to place an internally, electrically-illuminated exit locator sign on the forward-facing and aft-facing, upper inboard edge of a nearby bulkhead and one sign above the overwing emergency exit in direct compliance with § 25.811(d)(1),(2),(3).
3. GATS proposed to install electrically-illuminated signs that measured 1.54 X 4.84 inches with 1 inch high red letters. The proposed signs ranged from 6.01 to 6.78 square inches in area, excluding letters. These signs did not comply with the letter and background requirements of § 25.812(b)(1).

Applicable regulation(s)

§§ 25.811(d)(1),(2),(3) and 25.812(b)(1)

Regulation(s) requiring an ELOS

§ 25.812(b)(1)(i),(ii)

Description of compensating design features or alternative standards which allow the granting of the ELOS (including design changes, limitations or equipment need for equivalency)

Although marker and locator signs share common attributes of size, brightness, etc., the two signs address two separate concerns, as described in § 25.811:

- a. Marker signs are intended to provide a means of identifying an exit from the aisle in the vicinity of the exit. In recognition of this intended function, marker signs are usually mounted flush with the sidewall in the immediate vicinity of the exit, and are easily read from the aisle near the exit.
- b. Locator signs are intended to provide a means to identify the longitudinal location of an exit while approaching along the aisle, and are intended to be located above the aisle near the exit, or at another overhead location if it is more practical due to headroom.

Issue 1: Type I Locator Sign. The first issue related to the requirement for an exit locator sign “above the aisle... or at another overhead location (§ 25.811(d)(1)),” for the main cabin door. GATS proposed to place an internal, electrically-illuminated exit locator sign on the aft-face, upper-inboard edge of a nearby bulkhead to comply with § 25.811(d)(1), since “it is more practical because of low headroom... (§ 25.811(d)(1))” and to avoid passengers and crewmembers striking it as they move in the aisle. The BD-700-1A10 has approximately 72” to 74” of headroom after the carpet is installed.

Issue 2: Type III Locator Signs. The second issue related to the requirement for an exit locator sign “above the aisle...or at another overhead location (§ 25.811(d)(1)),” and on each bulkhead or divider that prevents fore and aft vision (§ 25.811(d)(3)),” for the Type III exit. GATS proposed to place internally, electrically-illuminated exit locator signs on the forward-facing and aft-facing, upper inboard edge of a nearby bulkhead and one sign above the overwing emergency exit to comply with § 25.811(d), since “it is more practical because of low headroom... (§25.811(d)(1))” and to avoid passengers and crewmembers striking it as they move in the aisle .

Issue 3: Size of exit signs. The third issue related to the size of exit signs. GATS proposed to show compliance with § 25.811(d)(1) locator signs, § 25.811(d)(2) exit markers, and § 25.811(d)(3) bulkhead/divider signs with electrically-illuminated signs that measured 1.54 x 4.84 inches with 1 inch high red letters and background areas excluding letters that ranged from 6.01 to 6.78 square inches. The letter height and background areas of the signs did not meet § 25.812(b)(1) and therefore an equivalent level of safety finding was required.

The following criteria was established for evaluating compliance to § 25.811(d) and an equivalent level of safety to § 25.812(b)(1):

- a. The legibility of the exit marker and locator signs must be confirmed by person(s) with 20/20 (or worse) eyesight. It must be determined that the signs are legible by occupants ranging from 5th percentile (in height) female (approximately 5' 2") to a 95th percentile (in height) male (approximately 6' 1"). The evaluation of each marker sign is to be accomplished from a standing position in the aisle opposite the exit. The evaluation of each locator sign is to be accomplished from all standing locations in the aisle, forward or aft of the sign, as appropriate. The signs should be illuminated during the evaluation.

The sign's background area is substantially less than required by § 25.812(b)(1) which could result in insufficient color contrast between the sign's letters and its background area due to the surrounding aircraft surface acting as the background area. In order to ensure legibility of the word "EXIT", the evaluation must consider either two worst case scenarios of background color or the existing background color but be subject to re-evaluation per a limitation on the Supplemental Type Certificate (STC) every time the background color changes. For the worse case scenario option, the first evaluation must be conducted with an aircraft background color that is the same color as the sign's letters (representing the worst case for a lighted cabin). The second evaluation must be conducted with an aircraft background color of black (representing a dark cabin).

- b. The illumination levels of the signs must be shown to meet the requirements of § 25.812(b)(1).

This evaluation was required to be conducted on a conformed representative interior installation, including the sign installations, during a FAA compliance inspection. An equivalent level of safety finding to the requirements of § 25.812(b)(1)(i) and § 25.812(b)(1)(ii) was granted contingent on a satisfactory evaluation to the above criteria.

Explanation of how design features or alternative standards provide an equivalent level of safety to the level of safety intended by the regulation

An equivalent level of safety finding, contingent on a satisfactory evaluation to the above criteria, was granted to allow the installation of exit signs that do not comply with the letter and background size requirements of § 25.812(b)(1). The intent of the size requirements of § 25.812(b)(1) is that the exit locator and marker signs be readily identifiable and be legible. Specifically, locator signs are intended to provide a means to identify the longitudinal location of an exit while approaching along the aisle, and marker signs are intended to provide a means of identifying an exit from the aisle in the vicinity of the exit. Section 25.812(b)(1) was adopted to be applicable to a range of transport category airplane sizes. The BD-700-1A10 airplane is a relatively small transport category airplane in terms of fuselage diameter and main aisle length. Because of these smaller dimensions, smaller exit signs can be legible from all applicable locations and meet the intent of § 25.811(b)(1)(i),(ii).

FAA approval and documentation of the ELOS

The FAA has approved the aforementioned Equivalent Level of Safety finding in issue paper C-1. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The Transport Directorate has assigned a unique ELOS memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS memorandum number should be listed in the Type Certificate Data Sheet under the Certification Basis section (TC's & ATC's) or on page 3 of the STC Certificate.

[E.g. Equivalent Safety Findings have been made for the following regulations:

§ 25.812(b)(1)(i),(ii) Emergency Lighting (documented in TAD ELOS Memo SP5109SE-T-C-1)].

The Equivalent Level of Safety finding criteria outlined in this memo maybe used by Goodrich Aviation Technical Services, Inc. on future BD-700-1A10 projects by referencing the ELOS memo number for the project (SP5109SE-T-C-1) and documenting compliance to the criteria contained in it, provided that the FAA concurs in writing that use of this ELOS is appropriate for that specific project. Each future Goodrich Aviation BD-700-1A10 STC project that is approved by the FAA to utilize this same ELOS must contain documentation of the utilization of the ELOS by referencing the ELOS memo on the face of the STC Certificate in the manner suggested in the preceding paragraph.

/Original signed by Jeff Gardlin/

Manager, Airframe and Cabin Safety Branch, ANM-115

7/23/02

Date

ELOS Originated by Seattle ACO:	Name Dan Jacquet	Org # ANM120S
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